# Effect of Spinal Versus General Anesthesia on Pulmonary Functions among Adults at Al-Sadder Medical City: Comparative Study

## تأثير التخدير النخاعي مقابل التخدير العام على وظائف الرئةعندالبالغين في مدينة الصدر الطبية :دراسة مقارنة

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**الخلاصة**

**الهدف:** تهدف الدراســة إلى كشــف تأثير التخدير النخاعي مقابل التخدير العام على وظائف التنفس, وكذلك إيجاد العلاقات بين الوظائف الرئوية ونوع التخدير.

**المنهجية:** دراســة مقطعية مقارنة أجريت في(مدينة الصــدر الطبية) بدأت بتأريخ الحادي عشــر من تشــرين الثاني 2015 ولغاية الثلاثون من نيســان 2016تم اختيار عينة الحصــص مكونة من 100 مريض تم تحضــيرهم للعمليات (50) مريض تحت تأثير التخدير العام و50 مريض تحت تأثير التخدير النخاعي) في مدينة الصــــدر الطبية. جمعت المعلومات من خلال إعداد اســـتبانة تم بنائها لغرض الدراســـة وكذلك اســـتخدام جهاز قياس وظائف الرئة (spirometer)وتم جمع البيانات من خلال المقابلة الشخصية وتكونت الاستبانة من جزأين, الجزء الأول تضمن 10 فقرات والجزء الثاني 3 فقرات .تم جمع المعلومات بواسطة أسلوب المقابلة الشخصية لعينة الدراسة وتم تحديد مصداقيتها من خلال عرضها على 13 خبير .بعد ذلك تم تحليل البيانات من خلال تطبيق التحليل الوصفي والتحليل الاستدلالي بواسطة استخدام برنامج الحزمة الإحصائية للعلوم الاجتماعية الإصدار 22.

**النتائج:** بيّنَت نتائج الدراسة بأن عُمر غالبية العينة ما بين 39- 47سنة ،نسبة الذكور إلى الإناث متساوية و معظمهم كانوا ضمن الوزن الطبيعي، وغير مدخنين ، وان غالبيتهم غير عاملين، وان نوع العملية للأجزاء السفلية للجسم هو أكثر من الأجزاء العليا للجسم، وجميع المرضى لا يعانون من أمراض الجهاز التنفسي وأكثرهم لا يملكون أمراض مزمنة وكذلك بينت النتائج بأن هناك علاقة قوية بين نوع التخدير ووظائف الرئة قبل وبعد العملية.

**الاستنتاج:** استنتجت الدراسة بأن التخدير يؤثر بشكل مباشر على وظائف الرئة.

**التوصيات:** أوصت الدراسة باستخدام التنفس العميق لعدة مرات من قبل المريض قبل العملية وقطع التدخين قبل العملية من4-8 أسابيع.يجب أن تكون هناك دراسات تقييم الآثار السريرية للتخدير عند المرضى الذين يعانون من مشاكل في وظائف الرئة وكذلك يجب على الجراح أن يختار طريقة التخدير المناسبة (عام أو نخاعي) اعتمادا على المعاينة السريرية، والاضطرابات المحتملة الأخرى، والاحتياجات الجراحية.

**Abstract**

**Objective**: The study aims to detect the effect of spinal versus general anesthesia on pulmonary function and find out the relationships between patients' pulmonary functions post- surgery and their demographic and clinical characteristics.

**Methodology**: A comparative study design carried out through the present study in order to achieve the early stated aims. The study started from 21 December 2015 to 30 April 2016 .The study conducted in Al-Sadder medical city. Quota sample of (100) patients were included in the present study, (50) patients received general anesthesia and (50) patients received spinal anesthesia. The patients' demographic and clinical data collected through the utilization the semi-structured questionnaire and by means of interview technique with the subject, while the pulmonary functions test collected by using spirometer instrument. Data was analyzed by using descriptive statistic (percentage and Frequencies) and inferential (person s correlation coefficient, independent sample t-test, and paired t-test).

**Results**: shows that higher of patient are within the age interval about 39-47 years old %),equal ratio of gender are male (50%)and female, there are highly significant of body mass index is normal (70%), most of patient are non-smoker (47%), most of patient non-worker is, high ratio of operation in the lower of body, all of patient without respiratory disorder, more the patient without chronic disease, The study results indicate that there is a significant effect of the anesthesia on the patients' pulmonary functions test and the general anesthesia is negatively affect the pulmonary functions more than the spinal anesthesia. In addition, that there is a high significant relationship between the pulmonary functions pre and post general anesthesia and high significant relation between the pulmonary functions pre and post spinal anesthesia and high significant relation between the pulmonary functions post-anesthesia and the types of anesthesia.

**Conclusions:** The study concluded that anesthesia has effect on pulmonary function.

**Recommendations:** The study recommended that breathing techniques should use for patients before anesthesia and smoking cessation before 4-8 weeks from surgery Studies should evaluate the clinical effects of different anesthesia regimes in patients with compromised lung function, and Reduction in FVC after surgery should influence the clinician's decision at this time when choosing between general and spinal anesthesia depends on the particular clinical situation, possible other disorders, and the surgical demands.

**Keywords**: Effect, Anesthesia, Pulmonary Functions Test, Surgery in Adults,

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# INTRODUCTION

Anesthesia and surgical still place the patient at risk for several complications related to procedure. Biologic variations of particular importance include age-related pulmonary change. The surgical patient is subject to several risks, the national surgical care improvement project (SCIP)set the national goal of 25% reduction in surgical complications by 2010 targeted areas include surgical site infection as well as cardiac ,respiratory and venous thromboembolic complications[(1)] .

The greatest threat to the safety of a sedated patient is airway compromise and/or respiratory arrest. To decrease the risk of airway and respiratory complications, careful attention must be directed toward the appropriate selection of medications, adherence to dosing recommendations, and most importantly the identification of the high-risk patient. Regardless of the clinical scenario or the medications used, appropriate monitoring of the patient's respiratory and physiologic functions is mandatory to rapidly identify respiratory compromise. As intervention may be necessary, immediate access to appropriate medications and equipment should be assured. In anticipation of respiratory adverse events, appropriate preparation and monitoring may help detect respiratory depression or upper airway obstruction and allow the opportunity for intervention to prevent further morbidity or mortality [(2)].

Complications of anesthesia unexpected and unwanted events it is common and potentially very dangerous they occur in approximately 10% of anesthetics.Only the minority of these complication cause lasting harm to the patient, death complicates five anesthetics per million given in 5% from the norm must be recognized and managed promptly and appropriately[(3)].

The effects of anesthesia alone on respiratory function generally is minor and short lived, but may tip the balance towards respiratory failure in patients with severe disease in anesthesia is associated with a decrease in functional residual capacity especially in the elderly and in obese patient. All inhalational agents cause dose -related respiratory depression this results in reduced minute ventilation, paco2 increases. Patient who smoke urged to stop 4 to 8 weeks before surgery need significant pulmonary and wound healing complications reduction [(4)].

Choice of anesthesia depends on the patient factors (clinical state) and surgical factors (type and duration of procedure).General anesthesia and endotracheal intubation is associated with increased morbidity. The fall in functional residual capacity and atelectasis noted in normal patients may also be seen in patients with chronic bronchitis [(5)].

Effect of surgery are dependent on its type and magnitude, clearly, patient with pre-existing respiratory disease are at much greater risk following upper abdominal and thoracic surgery than after limb, head, neck or lower abdominal surgery approximately anesthesia-related death rates in united states to be less than 1 per 10,000 surgeries[(6)].

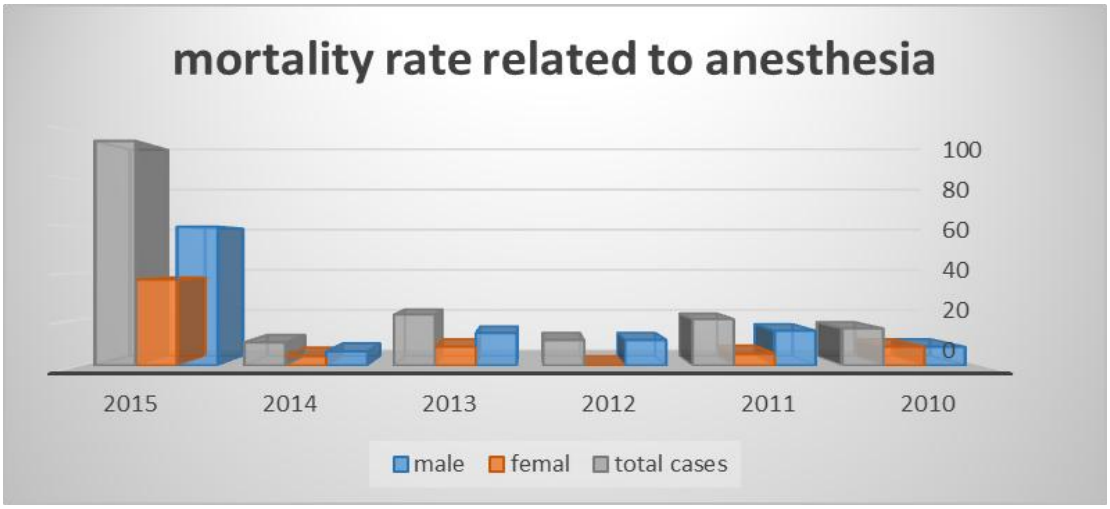
Elderly patients face higher risks from anesthesia and surgery compared to younger adult patient [(3)].

Potential complication on pulmonary functions related anesthesia (general), inadequate ventilation and occlusion of the airway, inadvertent intubation of the esophagus and hypoxia are significant potential complication associated with general anesthesia. Many factors can contribute to inadequate ventilation such as respiratory depression caused by anesthesia agents aspiration of respiratory tract secretions or vomitus and the patients positions on the operating table can compromise the exchange of gases. Anatomic variation can make the trachea difficult to visualize and result in insertion of the artificial airway into the esophagus rather than into the trachea, in addition to these dangers asphyxia caused by foreign bodies into the mouth, spasm of the vocal

cords, relaxation of the tongue, or aspiration of vomitus, saliva or blood can occur. In spinal anesthesia if the anesthetic agent reaches the upper thoracic and cervical spinal cord in high concentration, a temporary partial or complete respiratory paralysis results [7].

The ratio of mortality rate for patient, s due to anesthesia from 2010 to 2015 according to statistic unit of al-sadder-medical city [14]:As the following:

IN 2010: total death are 16 cases that are 8 males, 8 females.
IN 2011: total death are 20 cases that are 15 males, 5 females.
IN 2012: total death of males only are 11 without females.
IN 2013: total death are 22 cases that are 14 males, 8 females.
IN 2014: total death are 10 cases that are 6 males, 4 females.
IN 2015: total death are 97 cases that are 60 males, 37 females




So the researcher interested to do the study on Effect of Spinal versus General Anesthesia on Pulmonary Function for Surgery in Adults at Al-Sadder Medical City: Comparative Study because of the accelerating raise in mortality death because of anesthesia in the setting of study.

## METHODOLOGY:

**Objectives:** The study aims to detect the effect of spinal versus general anesthesia on pulmonary function and find out the relationships between patients' pulmonary functions post- surgery and their demographic and clinical characteristics.

**Research design:** A descriptive comparative design.

**Setting:** The study conducted at Al-sadder medical city at Al-Najaf city governorate.

**Duration of the study:** This study was carried out from 21 December 2015 to 30 April 2016.

**Study sample**: The population of this study was adult patients who admitted to surgery units without any respiratory diseases. Quota sample of (100) patients were including in the present sample of study (50) general anesthesia, (50) spinal anesthesia. The pulmonary functions measures for each patients' sample pre-operation and post-operation directly

**Tools and methods of data collection:** questionnaire form was developed by the researcher to obtain appropriate answers which include:

- **Part I:** demographical data include: (age, gender, weight, height, address, operation occupation, smoke, type of anesthesia, respiratory, disorder, chronic disease).

• **Part II:** include items about pulmonary function as following: forced vital capacity (**The volume of air that can be maximally forcefully exhaled**), forced expiration volume (**volume that has been exhaled at the end of the first second of forced expiration**), peak expiration flow rate (**It is the peak flow rate during expiration**) and this measuresby *spirometer* is an apparatus for measuring the volume of air inspired and expired by the lungs. It measures ventilation, the movement of air into and out of the lungs. Spirometer is the mainly piece of equipment used for basic pulmonary function tests, measuring lung function, specifically the amount and speed of air that can be inhaled and exhaled. Spirometry with flow volume loops assesses the mechanical properties of the respiratory system by measuring the expiratory volumes and flow rates[8] .This test requires the patient to make a maximal inspiratory & expiratory effort. The patient in a sitting position breathes into a mouth piece and nose clips are placed to prevent air leak. It is essential that the patient gives full effort during testing**.** In this study the pulmonary function test was made to each patient before entering the operating room and giving him anesthesia and after leaving the operating room directly to comparison between two results depending on the forced vital capacity, forced expiratory volume, and peak expiratory flow. At each assessment time, spirometry was performed at least three times to be able to meet the criteria of the European Respiratory Society (ERS)

**Ethical considerations:** The ethical approvals for conducting the study and sample selection were obtained from the director of health in Al-Najaf. Permission has been taken from the patients before starting the interview. Informed consent to participate and maintain confidentiality was observed. Before data collection researcher explained the objectives of this study to patients and request consent for participation in the study.

**Statistical analysis:** The data were analyzed through statistical package for social sciences (SPSS, version. 22). Descriptive statistical analysis was used to find out frequencies and percentage. Inferential statistical analysis was used through Chi-square test to determine the association between pulmonary function and types of anesthesia and ANOVA test was used for comparing between the types of anesthesia

## RESULTS:

The result of the study shows the following**:**

**Table (1): Socio-demographic characteristics of 100 patients**

| demographic data | rating and intervals | Frequency | Percent |
|---|---|---|---|
| **Age (year)** | <= 20 | 5 | 5 |
| | 21- 29 | 15 | 15 |
| | 30- 38 | 15 | 15 |
| | 39- 47 | 45 | 45 |
| | 48+ | 20 | 20 |
| **Gender** | Male | 50 | 50 |
| | Female | 50 | 50 |
| **BMI** | Normal | 70 | 70 |
| | Overweight | 10 | 10 |
| | Obese | 20 | 20 |
| **Occupation** | Employee | 35 | 35 |
| | Non-employee | 20 | 20 |
| | Jobless | 45 | 45 |
| **Smoking** | Non-smoker | 47 | 47 |
| | Smoker | 13 | 13 |
| | Passive smoker | 30 | 30 |
| | Ex-smoker | 10 | 10 |

| | | | |
|---|---|---|---|
| **Types of Operation** | Upper of the body | 45 | 45 |
| | Lower of the body | 55 | 55 |
| **Types of anesthesia** | General | 50 | 50 |
| | Spinal | 50 | 50 |
| **Respiratory disorders** | Non | 100 | 100 |
| **Chronic diseases** | Non | 58 | 58 |
| | Have a chronic diseases | 42 | 42 |

Table 1 shows that higher of patient are within the age interval about 39-47 years old(45%) and lower ratio of patients are in the age interval about<=20 years old(5%),equal ratio of gender are male (50%)and female(50%),there are highly significant of body mass index is normal(70%),most of patient jobless is(45%),most of patient are non-smoker(47%), high ratio of operation in the lower of body is(50%),equal ratio with types of anesthesia are general(50%)and spinal(50%), all of patient without respiratory disorder is (100%),patient without chronic disease(58%),and patient with chronic disease (42%).

**Table (2): Mean difference for the pulmonary functions pre and post general anesthesia**

| Pulmonary function test | T-Value | D.F. | P-Value |
|---|---|---|---|
| FEVpre – FEV post | 12.9 | 49 | 0.001 HS |
| FVCpre – FVC post | 5.5 | 49 | 0.001 HS |
| PEF pre –PEF post | 3.7 | 49 | 0.005 HS |

***FEV= forced expiratory volume.**
***FVC= forced vital capacity.**
***PEF=peak expiratory flow.**
***HS=high significant.**
***DF=degree of freedom**

Table 2 distinguish that there is high significant difference for the pulmonary functions pre and post general anesthesia at p-value p<0.05.

**Table (3): Mean difference for the pulmonary functions pre and post spinal anesthesia**

| Pulmonary function test | T-Value | D.F. | P-Value |
|---|---|---|---|
| FEVpre – FEV post | 9.5 | 49 | 0.001 HS |
| FVCpre – FVC post | 7.6 | 49 | 0.001 HS |
| PEF pre – PEF post | 4.2 | 49 | 0.002 HS |

Table 3 shows that there is high significant difference for the pulmonary functions pre and post spinal anesthesia at p-value p<0.05

**Table (4): Summery statistics for the differences between the pulmonary functions post-anesthesia and the types of anesthesia**

| Studied variables | t-value | D.F. | p-value |
|---|---|---|---|
| FEV Post | 3.378 | 98 | 0.003 HS |
| FVC Post | 2.929 | 98 | 0.009 HS |
| PEF Post | 4.054 | 98 | 0.001 |

| | |
|---|---|
| | HS |

Table 4 shows that there is a high significant difference between the pulmonary functions post-anesthesia and types of anesthesia at p-value $p<0.05$.

## DISCUSSION:

The primary function of the lungs is to provide an adequate gas exchange for maintaining normal oxygen content in blood and eliminate carbon dioxide. This is achieved by optimizing lung volumes to meet higher metabolic demand during the peri-operative period. General anesthesia causes respiratory impairment and both oxygenation and elimination of carbon dioxide are affected. The factors affecting pulmonary function include loss of consciousness, mode of ventilation (spontaneous or mechanical), posture of patient, actions of anesthetic agents and drugs, used during anesthesia on respiratory smooth muscles and secretions[9].

Table 2 and table 3 distinguish that there is high significant difference for the pulmonary functions pre and post general anesthesia, and spinal anesthesia. Which nearly similar to the results of the study done by(Tusman, et al 2009), this study concluded that the pulmonary function usually altered by anesthesia and by surgery. Atelectasis was found in most anesthetized patients and there is a marked increase in alveolar hypoventilation, V/Q inequalities and pulmonary shunt as early as with induction of anesthesia. These processes are responsible for the main cases of arterial hypoxemia in the PACU. Many concomitant factors that contribute to postoperative hypoxemic events must be considered such as the type and anatomical site of surgery causing a change in lung mechanics, hemodynamic impairment and respiratory depression from residual effects of anesthetic drugs [10].

Table 4 shows that there is a high significant difference between the pulmonary functions post-anesthesia and types of anesthesia. No studies detected significant differences between the pulmonary functions post-anesthesia and types of anesthesia concerning postoperative pulmonary or cardiovascular complications. The study was done by (Sorensen 2011) found (11%) of the sample with pulmonary complications post anesthesia, and studies done by(Thomsen 2009) found the pulmonary functions were affected post-surgery[11,12].

(Lung function after total intravenous anesthesia or balanced anesthesia with sevoflurane) study done by (W. Tiefenthaler et,al 2010) and agree with my study. The aim of this study was to investigate the effects of general and spinal anesthesia in patients with normal lung function, and shows a decrease in respiratory parameters (FVC, FEV1, and PEF) in patients emerging from general anesthesia. FVC decreased less in patients after spinal with sevoflurane than in patients who had undergone general anesthesia [13].

## CONCLUSION

According to the study findings and discussion, study concluded the following Both types of anesthesia has an effect on pulmonary functions and has an impact on effectiveness of those functions

## RECOMMENDATION:

Based on the study conclusion, the study recommends the following:

**1-** Education breathing technique before anesthesia utilization for patient undergoing surgery especially with respiratory disease.

**2-** Smoking cessation before 4-8 weeks before surgery to decrease post-operative respiratory complications.

**3-**Studies should evaluate the clinical effects of different anesthesia regimes in patients with compromised lung function.

**4-** Reduction in FVC after surgery should influence the clinician's decision at this time when choosing between general and spinal anesthesia depends on the particular clinical situation, possible other disorders, and the surgical demands.

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